

Use of interactive gaming for enhanced function after spinal cord injury

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VA Rehabilitation Research and Development - Pilot

Oct 1, 2010 – Sep 30, 2012

Project Summary/Abstract

The primary objective of this project is to implement a program of interactive video gaming as a form of rehabilitation exercise and to evaluate its potential for positive therapeutic outcomes in individuals with spinal cord injury (SCI). The specific goals are to 1) enhance early rehabilitation post acute SCI by providing an innovative, fun, activity-based regimen that will increase patients' adherence to their rehabilitation exercises and to 2) improve upper extremity conditioning and shoulder function in order to improve and maintain physical status, self-care activities, and community participation for persons with stable SCI.

While interactive video gaming has gained attention in the lay-press and is being used as a rehabilitation approach in some clinical settings with a variety of patient populations, there is an absence of clinical research regarding effectiveness and mechanisms of action. The purpose of this research proposal is to conduct two pilot studies designed to fill this gap in knowledge. Study 1 will involve a quantification of physical attributes of interactive gaming across multiple domains. Study 2 will involve a preliminary evaluation of the outcomes of interactive gaming as an adjunct to standard therapy during initial rehabilitation following an acute SCI.

The target population will be persons with SCI who use a wheelchair as primary mobility. Healthy volunteers with tetraplegia or paraplegia, between 18 and 75 years of age, of any ethnicity and both genders will be recruited for these studies. The proposal consists of two components:

Study 1: Quantification of Play. This will be a cross-sectional study with approximately 30 participants with SCI of greater than one year, evenly distributed between tetraplegia and paraplegia. The purpose will be to evaluate muscles used, active range of motion, forces generated, heart rate, and other measurable attributes of the actions used during interactive video gaming play. Participants will perform two sessions of gaming, one to establish familiarity and make adjustments as needed and the second for measurement of multiple variables related to kinematic, biomechanical, and physical aspects of gaming. Data will be analyzed separately for injury level (ie, comparisons will be made separately for high tetraplegia, low tetraplegia, and paraplegia).

Study 2: Therapeutic Effectiveness Trial. This will be a prospective study involving the addition of an interactive video gaming regimen as adjunctive therapy to standard therapeutic exercise during rehabilitation following an acute SCI. Participants will be recently injured, medically stable, and undergoing initial rehabilitation. The protocol will run for six weeks, conducted "in house" to facilitate supervision. Participants will be randomized (with stratification for level of injury) into standard therapy or therapy plus gaming groups; those in the gaming group will be expected to play at least 3x per week, at least 30 minutes per session. More play will be allowed and will be monitored. Each person will serve as his/her own control. We expect 8-10 persons in each group to complete the protocol. Participants will perform at self-selected intensity; duration of each session and frequency of sessions will be automatically recorded. All measures will be assessed three times: at baseline, at 3 weeks, and at completion of the program. Changes in the following variables will be evaluated: balance, strength, active range of movement per joint, coordination, hand and shoulder function, and compared across groups, matching for injury level as described above. Outcome measures will include physical responses and changes in self care activities related to preventive health. Impressions of and satisfaction with interactive gaming will be determined especially as they relate to adherence with the program.

Long term objectives, beyond the purview of this study, include systematic testing, likely in a multi-site study, of various gaming protocols to evaluate effectiveness related to level/severity of injury as well as identification of characteristics associated with outcomes (age, computer experience, etc) and potential for enhanced upper limb function, ongoing health maintenance, secondary injury prevention, and improved community mobility.